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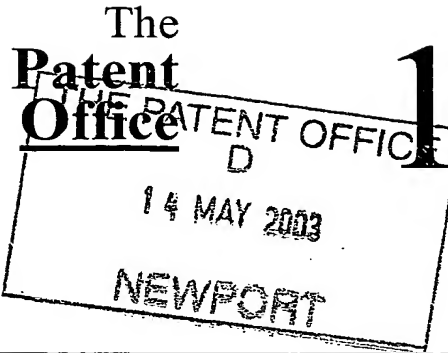
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Dated 30 July 2003



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1/77

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Request for grant of a patent

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1.	Your reference	JL3774		
2.	Patent application number (The Patent Office will fill in this part)	14 MAY 2003	14MAY03 E807015-1 D02806 P01/7700 0.00-0311014.5	
3.	Full name, address and postcode of the or of each applicant (underline all surnames)	3M INNOVATIVE PROPERTIES COMPANY P.O. BOX 33427 ST. PAUL, MN 55133-3427 USA Patents ADP number (if you know it) If the applicant is a corporate body, give the country/state of its incorporation DELAWARE, USA 0311014.5 8082232002		
4.	Title of the invention	INSERT ADAPTORS FOR CONNECTING RESERVOIRS TO SPRAYGUNS		
5.	Name of your agent (if you have one)	Barker Brettell		
	"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	138 Hagley Road Edgbaston Birmingham B16 9PW Patents ADP number (if you know it) 7442494002		
6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of Filing (day/month/year)
7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application		Date of filing (day/month/year)
8.	Is a statement of inventorship and of right to grant of a patent required in support of this request (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))	YES		

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Description 18 + 18

Claim(s)

Abstract

Drawing(s) 14 + 14

10. If you are also filing any of the following, state how many against each item.

Priority documents -

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Statement of inventorship and right to grant of a patent (*Patents Form 7/77*) -

Request for preliminary examination -
(*Patents Form 9/77*)

Request for substantive examination -
(*Patents Form 10/77*)

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11. I/We request the grant of a patent on the basis of this application.

Signature

Barker Brettell

Date

Barker Brettell

13.05.03

12. Name and daytime telephone number of person to contact in the United Kingdom

D. WIGHTMAN

Tel: 0121 456 1364

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INSERT ADAPTORS FOR CONNECTING RESERVOIRS TO SPRAYGUNS

Field of the Invention

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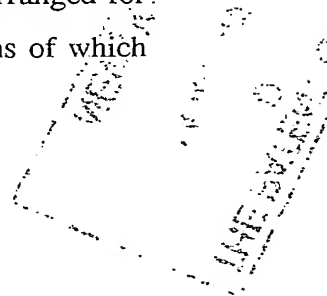
This invention concerns the liquid spraying apparatus described and claimed in our co-pending UK patent application No. 0224698.1 filed on the 24 October 2002 and UK patent application No. 0305614.0 filed on the 12 March 2003 whose specifications should be read in conjunction
10 with this application.

More especially, this application further develops and describes arrangements for connecting the reservoir to the spray gun that embody at least some of the principles and concepts of the inventions outlined in our
15 earlier application.

Background of the Invention

The inventions of our co-pending applications relate to the connection
20 between a spray gun and a reservoir containing liquid to be sprayed. More especially, the inventions concern a releasable connection for detachably mounting the reservoir on the spray gun and to a spray gun adapted for such connection.

25 Our co-pending applications describe liquid spraying apparatus comprising a spray gun and a reservoir for a liquid to be sprayed, the reservoir having an outlet connectable to the spray gun to permit the liquid to be withdrawn from the reservoir in use, and the spray gun having integral connector means arranged for non-threaded engagement with co-operating connector means by means of which
30 the reservoir can be releasably secured to the spray gun.



Summary

The present invention provides a spray gun with an integral socket for
5 connecting a reservoir provided with a mateable connector and inserts for
converting the socket for connecting a non-mateable connector. In this
way, the spray gun can be adapted to mount reservoirs provided with
different connectors in a simple, effective manner. The invention may
also have application for providing a connection to a remote reservoir via
10 a supply line, e.g. tubing, having an appropriate mateable connector for
connection to the socket or insert.

Preferably, the inserts are plastics mouldings but other materials
including metals may be used. Typically, the inserts are nylon
15 mouldings.

In one arrangement the spray gun is provided with a non threaded socket
and an integral retainer formation externally of the socket such that a
reservoir provided with a mateable retainer formation can be located and
20 secured to the spray gun by a push-twist action requiring less than one
complete turn of the reservoir relative to the spray gun.

The inserts of the present invention enable the spray gun to be adapted to
connect reservoirs provided with conventional screw threaded connectors
25 or other types of connector that are non-mateable with the integral
retainer formation on the spray gun.

The inserts may be provided with a retainer formation mateable with that
on the spray gun to locate and retain the insert. In this way, the insert

can be employed to locate and retain the reservoir and prevent inadvertent or accidental separation of the reservoir from the socket.

Alternatively, the inserts may be arranged to block or circumvent the integral retainer formation on the spray gun so that it does not interfere with the connection to the reservoir. The insert is then preferably an interference fit in the socket to reduce the risk of inadvertent or accidental separation of the insert (and attached reservoir) from the socket.

10

There now follows a description of embodiments of the connector means for releasably securing the reservoir to the spray gun with reference to the following drawings (numbered to follow on from those of our co-pending applications) in which:

15

Brief description of the drawings

Figure 20 is a section through an inlet port in the body of a gravity feed spray gun provided with an external retainer formation;

20

Figure 21 is a perspective view of an insert adapter for the inlet port shown in Figure 20;

Figure 22 is a plan view of the insert adapter shown in Figure 21;

25

Figure 23 is a side view of the insert adapter shown in Figure 21;

Figure 24 is a sectional view of the insert adapter shown in Figure 21;

Figure 25 shows the insert adapter of Figures 21 to 24 mounted in the inlet port of the spray gun body shown in Figure 20;

5 Figure 26 is a perspective view of an alternative insert adapter for the inlet port shown in Figure 20;

Figure 27 is a plan view of the insert adapter shown in Figure 26;

10 Figure 28 is a side view of the insert adapter shown in Figure 26;

Figure 29 is a sectional view of the insert adapter shown in Figure 26;

15 Figure 30 is a perspective view of another insert adapter for the inlet port shown in Figure 20;

Figure 31 is a plan view of the insert adapter shown in Figure 30;

20 Figure 32 is a side view of the insert adapter in the direction of arrow A shown in Figure 31;

Figure 33 is a sectional view of the insert adapter shown in Figure 30;

25 Figure 34 is a sectional view showing the insert adapter of Figures 30 to 33 mounted in the inlet port of the spray gun body shown in Figure 20;

Figure 35 is a perspective view of another insert adapter for the inlet port shown in Figure 20;

30 Figure 36 is a plan view of the insert adapter shown in Figure 35;

Figure 37 is a side view of the insert adapter in the direction of arrow B shown in Figure 36;

5 Figure 38 is a side view of the insert adapter in the direction of arrow C shown in Figure 36;

Figure 39 is a sectional view of the insert adapter shown in Figure 35;

10 Figure 40 is a perspective view of another insert adapter for the inlet port shown in Figure 20;

Figure 41 is a plan view of the insert adapter shown in Figure 40;

15 Figure 42 is a side view of the insert adapter in the direction of arrow D shown in Figure 41;

Figure 43 is a side view of the insert adapter in the direction of arrow E shown in Figure 41;

20 Figure 44 is a sectional view of the insert adapter shown in Figure 40;

Figure 45 is a perspective view of a reservoir with integral spout adapted for connection to the spray gun of Figure 20;

25 Figure 46 is a side view of the reservoir shown in Figure 45;

Figure 47 is a longitudinal sectional view of the reservoir shown in Figure 45;

30 Figure 48 is a perspective view of a reservoir lid with integral spout adapted for connection to the spray gun of Figure 20;

Figure 49 is a side view of the reservoir lid shown in Figure 48;

5 Figure 50 is a longitudinal sectional view of the reservoir lid shown in Figure 48;

Figure 51 is a side view showing a modification to the insert of Figures 21 to 24; and

10 Figure 52 is a side view showing a modification to the insert of Figures 26 to 29.

Detailed Description of the Exemplary Embodiments

15 The following description and accompanying drawings are directed to arrangements for securing a reservoir to a spray gun. Other details of the construction and operation of the reservoir and spray gun are not described or illustrated and the reader is directed to our aforementioned co-pending UK patent applications, the contents of which are incorporated herein by reference, for such details. Where appropriate in the following description, like reference numerals
20 are used in the series 600, 700, 800, 900, 1000 and 1100 to indicate corresponding parts as well as parts similar to parts described and illustrated in our aforementioned co-pending UK patent applications.

Referring first to Figure 20, there is shown a non-threaded socket 621 in the
25 body 603 of a gravity feed spray gun. The socket 621 has a cylindrical outer bore portion 621a and a cylindrical inner bore portion 621b connected by an internal annular shoulder 621c. The inner bore portion 621b is of smaller diameter than the outer bore portion 621a. At the bottom of the socket 621 is a sealing face 621d, the purpose of which will be described later.

Spaced above the socket 612 is a radial lug 686 integral with the gun body 603. The lug 686 extends for part of the circumference of the socket 621 and is set back from the marginal edge of the outer bore portion 621a.

5 Referring now to Figures 21 to 24, there is shown a plastics moulded insert 680, for example a nylon insert 680, for mounting in the socket 621 to convert the socket 621 to receive a threaded connector (not shown) for attaching a paint reservoir. The threaded connector may be an integral part of the reservoir or a separate part to which the reservoir is releasably connected.

10

The insert 680 is a plastics moulding, for example a nylon moulding, and has a tubular body provided with an external hexagonal flange 687 at one end for engagement with a spanner or the like tool. The insert 680 has a cylindrical upper body portion 680a depending from the flange 687 and connected to a
15 cylindrical lower body portion 680b of reduced diameter by an external annular shoulder 680c.

The lower body portion 680b is sized to be an interference fit in the inner bore portion 621b to provide a fluid tight seal within the socket 621. The upper body
20 portion 680a may be sized to be an interference fit in the upper bore portion 621a but more preferably is a close fit to facilitate insertion of the insert 680 in the socket 621 as described later.

The upper body portion 680a is provided with upper and lower radial projections
25 680d, 680e of trapezium section that extend for approximately 180 degrees around the circumference of the upper body portion 680a. As shown, the upper projection 680d is also of helical form whereas the lower projection 680e is entirely parallel to the shoulder 680c. In this embodiment, the projection 680d has a pitch of approximately 3mm but it will be understood this is not essential
30 and that the pitch may be altered to suit any given application.

The insert 680 has a through bore 688 with an upper threaded portion 688a connected to a lower non-threaded portion 688b of reduced diameter by an internal shoulder 688c. The shoulder 688c provides an internal stop to limit engagement of a threaded connector with the upper bore portion 688a to secure a paint reservoir.

In use, the insert 680 is located in the socket 621 by first orienting the insert so that the gap 689 that extends for approximately 180 degrees around the circumference of the upper body portion 680a, between the two ends of the projections 680d, 680e, is aligned with the radial lug 686 on the gun body 603. The insert 680 can then be pushed into the socket 621 until the end of the upper projection 680d furthest from the flange 687 is positioned below the lug 686.

The insert 680 can then be rotated to engage the upper projection 680d with the underside of the lug 686 as shown in Figure 25, for example, by engaging the flange 687 with a spanner. The helical form of the upper projection 680d provides a ramp face co-operable with the lug 686 as the insert 680 is rotated.

As a result, the insert 680 is displaced further into the socket 621 until the lower projection 680e engages the gun body 603 around the perimeter of the socket 621. This requires less than one complete turn of the insert 680. The underside of the lug 686 may be of helical form having a pitch similar to that of the projection 680d to assist axial displacement of the insert 680 by engagement of the projection 680d with the underside of the lug 686.

At this point, the interference fit of the lower body portion 680b in the inner bore portion 621b to provide a fluid-tight seal between the gun body 603 and the insert 680 within the socket 621 is assured.

The insert 680 is also locked in position and prevented from being axially withdrawn from the socket 621 until it is rotated in the reverse direction to re-align the lug 686 with the circumferential gap 689 between the ends of the projections 680d, 680e.

5

With the insert 680 located and secured in place, the paint reservoir can be secured to the spray gun by means of a threaded connection to the threaded bore portion 688a of the insert 680. If desired, the insert 680 may be held in place while the paint reservoir is attached to or removed from the spray gun by gripping the flange 687 with a spanner or other suitable tool. The threaded connection may be provided as an integral part of the reservoir or by a separate adaptor to which the reservoir can be releasably connected.

10

As will be appreciated, the lower projection 680e provides a stop to limit displacement of the insert 680 into the socket 621 and prevent the insert 680 being damaged by rotation beyond that required to secure the insert 680 and provide an effective seal within the socket 621. Furthermore, the insert 680 is prevented from rotating as the connector is screwed into the bore 688a by engagement of the projections 680d, 680e with the lug 686 and the gun body 603 respectively.

15

20

In a modification shown in Figure 51, an axial abutment 680h is provided at the upper end of the helical projection 680d. The abutment 680h provides an end stop co-operable with the lug 686 to limit rotation of the insert 680 relative to the lug 686 and prevent over-tightening when the insert 680 is secured in the socket 621.

25

In another modification (not shown), the lug 686 may be extended further around the circumference of the socket 621 with a corresponding reduction in the length

of the projections 680d, 680e on the insert 680 so that the lug 686 can pass through the gap between the ends of the projections.

5 In another modification (not shown), the projection 680e may be positioned above the projection 680d so that the lug 686 is received between the projections 680e, 680d with the projection 680e again acting as a stop to limit axial movement of the insert 680 into the socket 621 by engagement with the lug 686. Alternatively or additionally, the helical projection 680d may be provided with an end stop as described above to limit rotation of the insert 680 relative to the lug 686. 10 Alternatively, the gap between the upper and lower surfaces of the projections 680d, 680e may reduce sufficiently to limit rotation of the insert 680 relative to the lug 686.

Referring now to Figures 26 to 29, there is shown another plastics moulded 15 insert 780 generally similar to the insert 680 above-described.

As shown, the insert 780 has an annular flange 787 at one end and a helical projection 780d on the upper body portion 780a for co-operating with the radial lug 686 on the gun body 603 as described above. The lower projection 780e is 20 omitted and the lower body portion 780b is of increased length and is a close fit rather than an interference fit in the inner bore portion 621b to facilitate insertion of the insert 780 in the socket 621.

In use, the insert 780 is inserted into the socket 621 by aligning lug 686 with the 25 circumferential gap 789 between the ends of the projection 780d and rotated to locate the projection 780d under the lug 686 on the gun body 603 as described above. The insert 780 can then be rotated by engaging the flange 787 with a suitable tool or when screwing the connector for the paint reservoir (not shown) into the insert 780.

On being rotated, the insert 780 is displaced axially into the socket 621 by engagement of the projection 780d with the underside of the lug 686 until a sealing face 780f at the inner end of the insert 780 contacts the sealing face 621d (Figure 20) at the bottom of the socket 621.

5

The sealing face 780f may be provided by the insert itself, for example a lip moulded integrally with the insert 780 of the same or softer plastics or by a seal located in the end wall of the insert, for example a rubber O-ring (not shown). Likewise, the sealing face 621d may be provided by the gun body 603 itself, for example an internal abutment shoulder or by a seal located at the bottom of the socket 621, for example a nylon sealing ring or washer.

10

In a modification (Figure 52), an axial abutment 780h is provided at the upper end of the helical projection 780d that provides an end stop co-operable with the lug 686 to limit rotation of the insert 780 relative to the lug 686 and prevent over-tightening of the insert 780. In another modification (not shown), the lower body portion 780b may be an interference fit in the inner bore portion 688b to provide a fluid-tight seal without engaging the sealing face 621d at the bottom of the socket 621.

15

20

In the above-described embodiments, the helical projection 680d, 780d has a pitch of 3mm and the co-operating surface on the lug 686 has a similar pitch. It will be understood this is not essential however and that any suitable pitch may be employed. Furthermore, while the helical projections 680d, 780d and, where provided, stop projection 680e extend for approximately 180 degrees to leave a gap 689 of approximately 180 degrees in a circumferential direction for passage of the lug 686, it will be understood that this is also not essential and that the circumferential extent of the projections 680d, 680e, 780d can be altered provided the resulting gap 689 is of sufficient size for the lug 686 to pass through.

25

30

Referring now to Figures 30 to 34, there is shown another plastics moulded insert 880 that can be used to convert the socket 621 for engagement of a threaded connector to secure the paint reservoir.

5

As shown the insert 880 has an annular flange 887 at one end that is provided with a cut-out 887a of a size and shape to receive the lug 686 on the gun body 603. The helical projection and stop projection of the previous embodiments are omitted from the upper body portion 880a and the lower body portion 880b is
10 sized to be an interference fit in the inner bore portion 621b to provide a fluid-tight seal.

In use, the insert 880 is positioned with the cut-out 887a aligned with the lug 686 on the gun body 603. The insert 880 is then inserted axially into the socket 621
15 until the flange 887 is seated on the gun body 603 around the socket 621 and the lug 686 is received in the cut-out 887a as shown in Figure 34. The insert 880 is then prevented from rotating relative to the gun body 603 when the threaded connector for securing the reservoir is screwed into the insert 880 by engagement of the lug 686 in the cut-out 887a.

20

As will be appreciated, unlike the previous embodiments, the insert 880 is not axially retained by engagement with the lug 686 and relies on the interference fit of the insert 880 in the socket 621 both to seal and retain the insert 880 in a fluid-tight manner. The interference fit can be enhanced by forming the insert 880 so
25 that the upper body portion 880a will expand when the threaded connector for securing the reservoir is screwed into place.

Referring now to Figures 35 to 39, there is shown another plastics moulded insert 980 that can be used to convert the socket 621 for engagement of a
30 threaded connector to secure the paint reservoir.

The flange 987 is provided with a cut-out 987a and is also formed with opposed flats 987b. The cut-out 987a is larger than the lug 686 in a circumferential direction. As a result, the insert 980 can rotate to a limited extent when inserted
5 in the socket 621 and the flats 987b allow the insert 980 to be held with a tool to prevent the insert 980 rotating when the threaded connector for securing the reservoir is screwed into the insert 980.

Again, the insert 980 is not axially retained by engagement with the lug 686 and
10 relies on the interference fit of the insert 980 in the socket 621 both to seal and retain the insert 980 in a fluid-tight manner. The interference fit can again be enhanced by forming the insert 980 so that the upper body portion 980a will expand when the threaded connector for securing the reservoir is screwed into place.

15 Referring now to Figures 40 to 44, there is shown a modification to the insert 980 in which the lower body portion 980b is provided with a pair of axially spaced, annular sealing ribs 980d, 980e. The ribs 980d, 980e are continuous in a circumferential direction and provide a fluid-tight seal with the inner bore portion
20 621b when the insert 980 is located in the socket 621.

It will be appreciated that the number and arrangement of the sealing ribs 980d, 980e may be altered from that shown and that any of the inserts 680, 780, 880, 980 described herein may be provided with one or more sealing ribs for sealing
25 the insert in the socket 621.

As will now be apparent, each of the inserts 680, 780, 880, 980 above-described converts the non-threaded socket 621 in the gun body 603 to receive a threaded connector for securing a separate paint reservoir. It will be understood,
30 however, that the outlet spout of the reservoir could be adapted in similar manner

to each of the inserts to permit the reservoir to be connected directly to the socket of the gun body.

The spout and reservoir could be formed separately and secured together, for example by welding, or they could be formed integrally, for example by moulding. Figures 45 to 47 shows a moulded plastics reservoir 1002 provided with an integral spout 1015 at one end for connection to the socket 621 and a removable lid 1090 at the opposite end for adding liquid to the reservoir 1002. The lid 1090 is provided with an annular seal 1091 and an air vent 1092 closed by a removable plug 1093.

As shown, the spout 1015 has a cylindrical portion 1080a provided with a helical projection 1080d for co-operating with the lug 686 on the gun body 603. The cylindrical portion 1080a leads to an externally threaded portion 1080g that is a clearance fit in the outer bore portion 621a of the socket 621 and in turn leads to a cylindrical portion 1080b that is received in the inner bore portion 621b of the socket 621.

The reservoir 1002 is secured to the gun body 603 in similar manner to the insert 780 above-described by inserting the spout 1015 into the socket 621 with the lug 686 aligned with a gap 1089 between the ends of the helical projection 1080d. The reservoir 1002 is then rotated to engage the helical projection 1080d with the underside of the lug 686 causing the spout 1015 to move into the socket 621 until a sealing face 1080f at the inner end contacts and forms a fluid tight seal with an opposed sealing face in the socket 621.

In a modification (not shown), the cylindrical portion 1080b is an interference fit within the inner bore portion 621b to provide a fluid tight seal in similar manner to the insert 680. Alternatively, the cylindrical portion 1080b may be provided

with one or more sealing ribs to provide a fluid tight seal with the inner bore portion 621b similar to the insert 980.

5 The cylindrical portion 1080a may be provided with a second projection similar to the insert 680 that provides a stop to limit insertion of the spout 1015 into the socket 621. Alternatively or additionally, an axial abutment may be provided at the upper end of the helical projection 1080d to provide an end stop to limit rotation of the insert relative to the lug 686.

10 The screw threaded portion 1080g allows the reservoir 1002 to be connected to a spray gun provided with a threaded socket either in the gun body or in an adaptor mounted on the gun body. It will be understood that the screw threaded portion 1080g may be omitted.

15 In another arrangement, the reservoir could be provided with a separate detachable part such as a lid and the spout and lid could be formed separately and secured together or they could be formed integrally. Figures 48 to 50 show a moulded plastics lid 1110 for a reservoir (not shown) of the type disclosed in our afore-mentioned applications.

20

As shown, the lid 1110 is provided with an integral spout 1115 for connection to the socket 621. The spout 1115 is similar to the integral spout 1015 of the reservoir 1002 described above and the construction and operation will be understood from the previous description of the spout 1015.

25

Where the outlet spout is adapted for connection directly to the socket, a valve system may be incorporated into the connection such that, on connecting the spout, a shut-off device is opened to facilitate the flow of liquid from the reservoir to the spray gun. The shut-off device may be opened in response to

insertion and/or rotation of the outlet in the socket and closed by a reverse operation when disconnecting the reservoir.

It will also be understood, that each of the inserts 680, 780, 880, 980 could be adapted to convert the socket 621 to mount the reservoir using any other connection system to secure the reservoir to the insert.

For example, the insert and reservoir could be provided with interengageable bayonet formations as described in our published International patent application No.98/32589.

Alternatively, one of the insert and reservoir could be provided with a flange and the other with at least one hook member engageable with the flange as described in our International patent Application No.01/12337.

Alternatively, one of the insert and reservoir could be provided with a flange and the other with at least one spring leg arranged to engage the flange and permit rotation of the reservoir relative to the socket in a fluid tight manner as described in our co-pending UK patent application No.0307902.7 filed 5 April 2003.

Other arrangements for releasably securing the reservoir to the spray gun will be apparent to those skilled in the art.

As will now be appreciated, the present invention provides a spray gun with an integral non-threaded socket to receive a non-threaded connector and an integral retainer formation externally of the socket for retaining the connector, and inserts for converting the socket to receive threaded or other types of non-mateable connectors.

In this way, reservoirs having a range of different connectors can be secured to the spray gun. Furthermore, by providing the retainer formation externally of the socket on the spray gun, a visual check of the integrity of the connection can be made.

5

The inserts can employ retainer formations co-operable with that on the spray gun or be arranged to block or circumvent the retainer formation on the spray gun such that it does not interfere with the connection to the reservoir.

10 While the invention has been described with the provision of one retainer formation on the spray gun, it will be understood that a plurality of retainer formations could be provided spaced apart around the circumference of the socket for engagement with co-operating mateable formations on the reservoir or insert.

15

It will also be understood that the invention is not limited to a connector system employing a helical form of retainer formation and that other shapes and configurations of retainer formation may be used.

20 It will also be appreciated that the exemplary embodiments described herein are intended to illustrate the diverse range and application of the invention and that features of the embodiments may be employed separately or in combination with any other features of the same or different embodiments of this or our earlier co-pending UK patent
25 applications.

Moreover, while the exemplary embodiments described and illustrated are believed to represent the best means currently known to the applicant, it will be understood that the invention is not limited thereto and that various modifications

and improvements can be made within the spirit and scope of the invention as generally described herein.

11.14

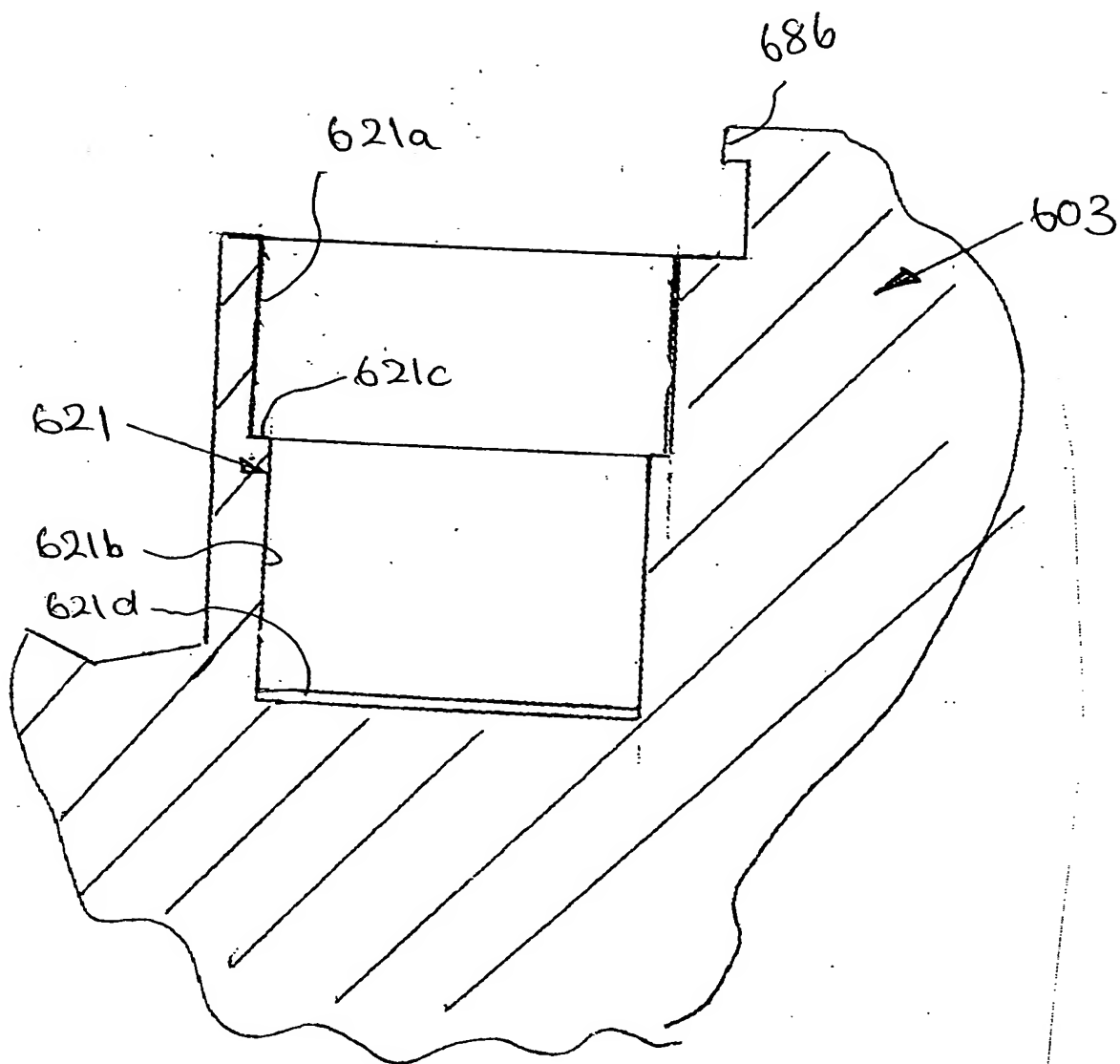


FIGURE 20

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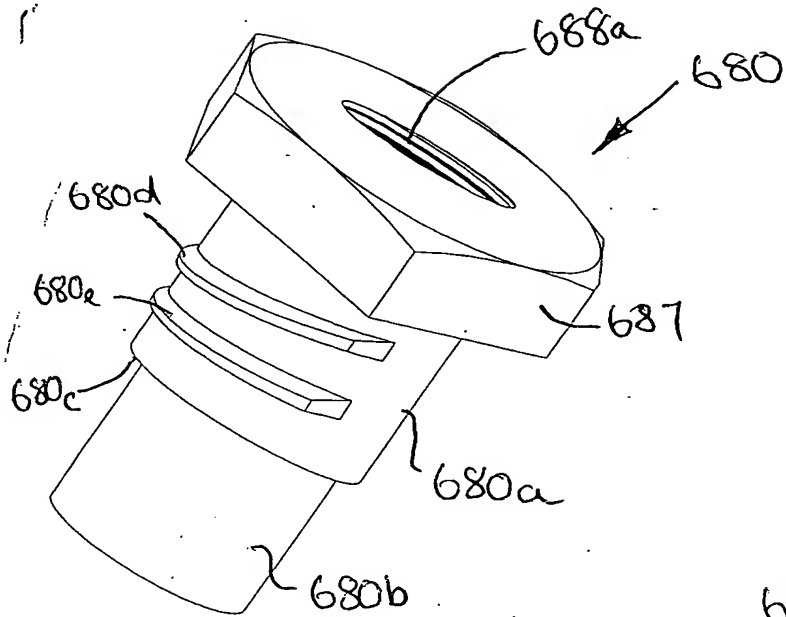


FIGURE 21

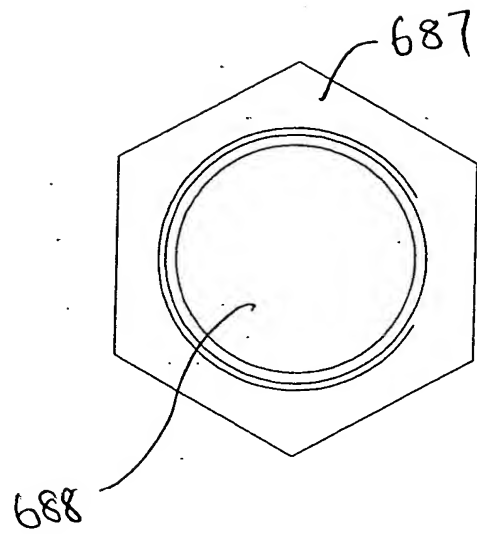


FIGURE 22

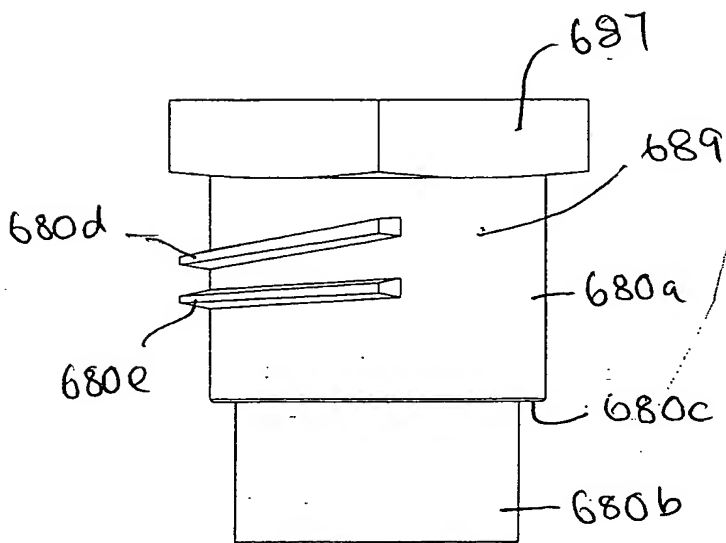


FIGURE 23

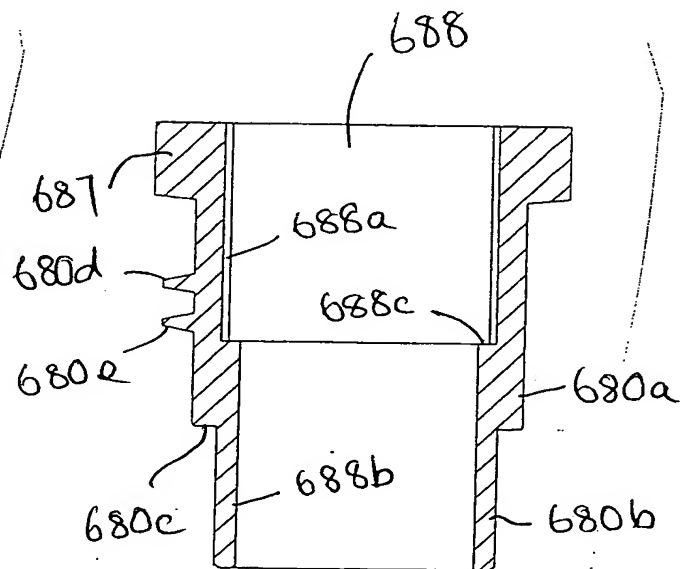


FIGURE 24

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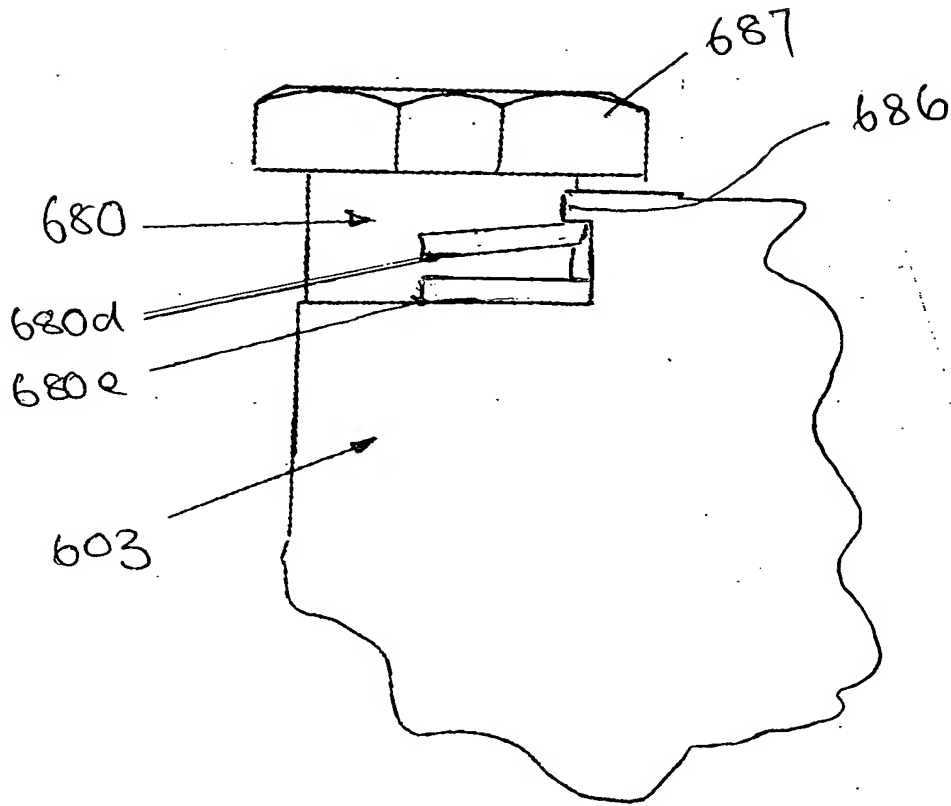


FIGURE 25

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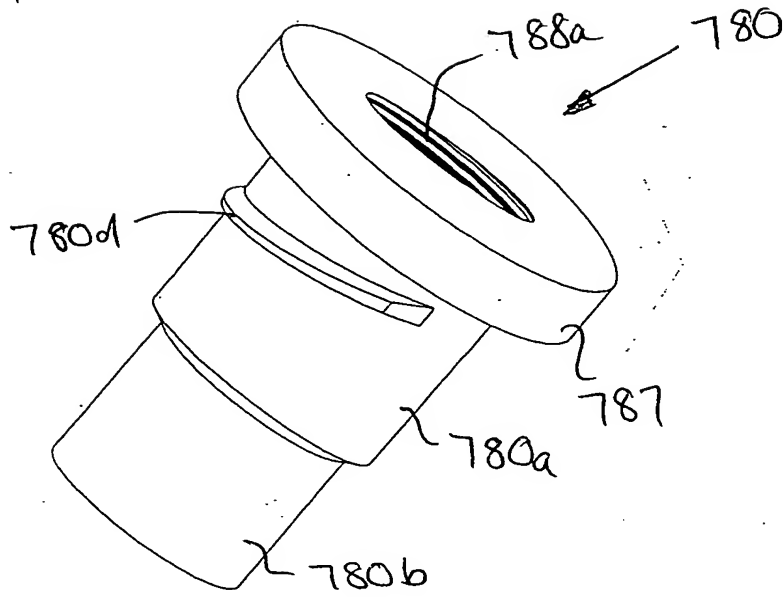


FIGURE 26

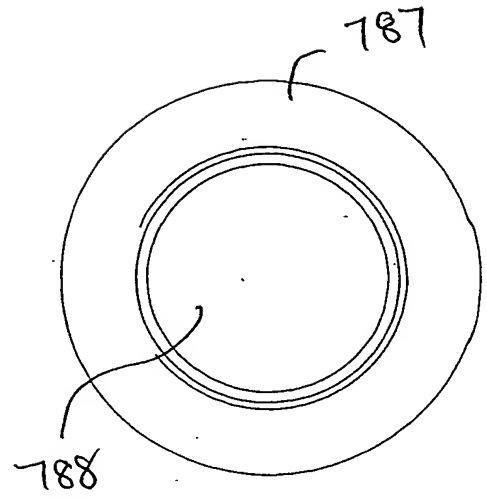


FIGURE 27

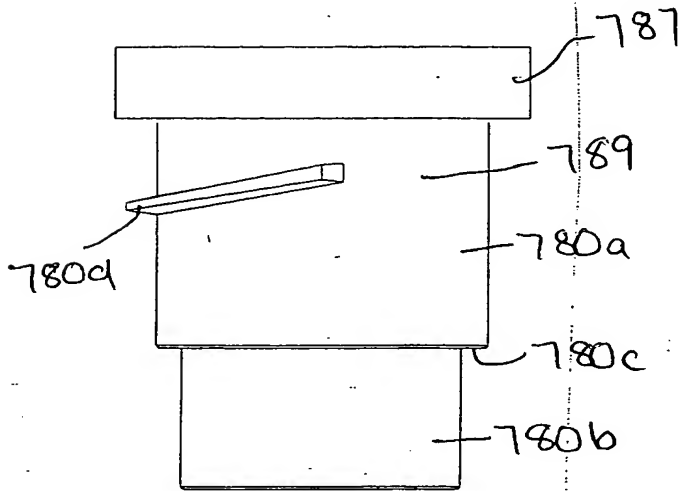


FIGURE 28

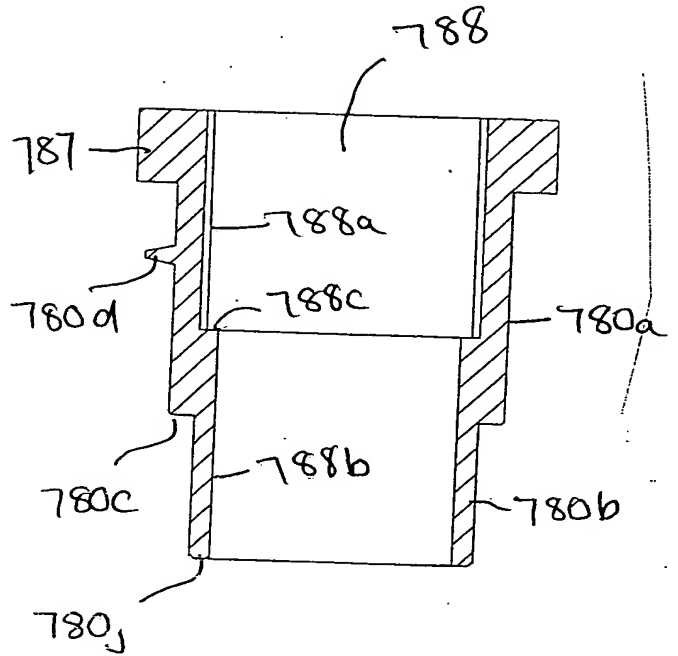


FIGURE 29

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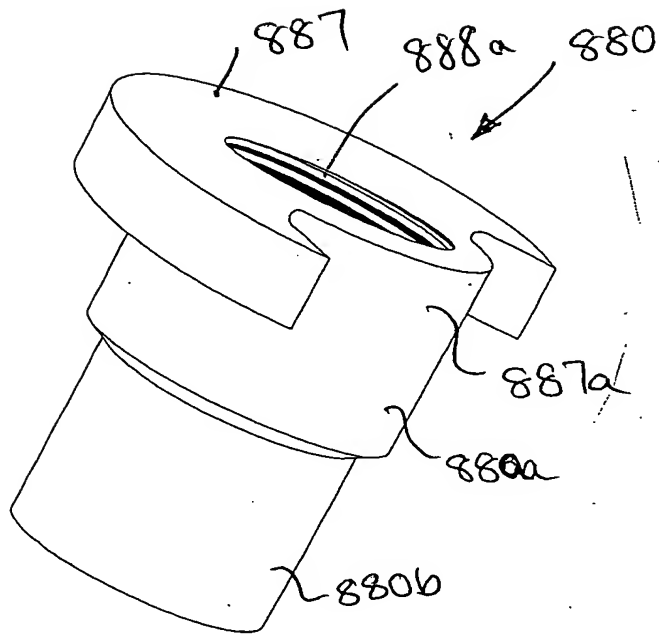


FIGURE 30

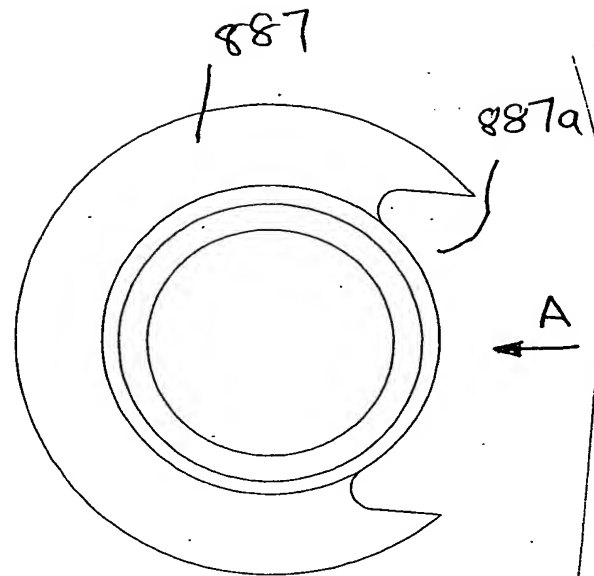


FIGURE 31

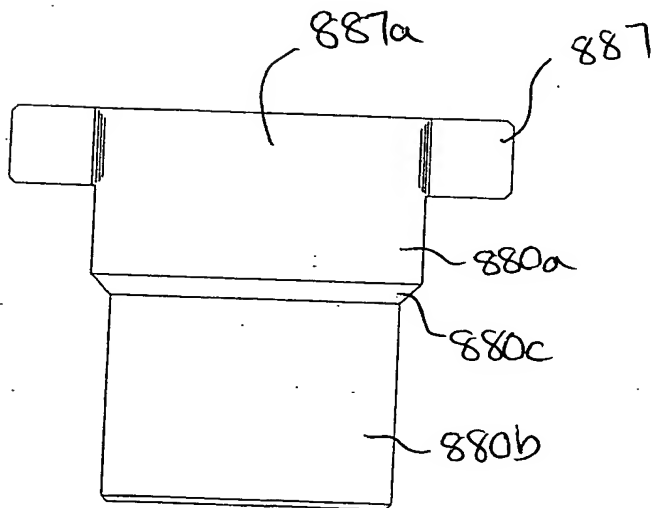


FIGURE 32

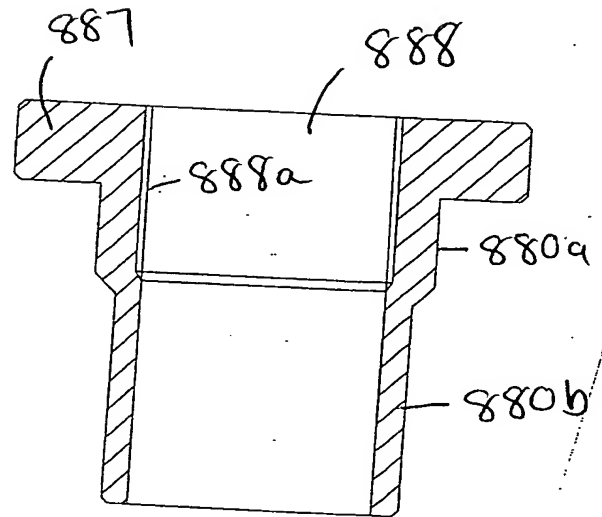


FIGURE 33

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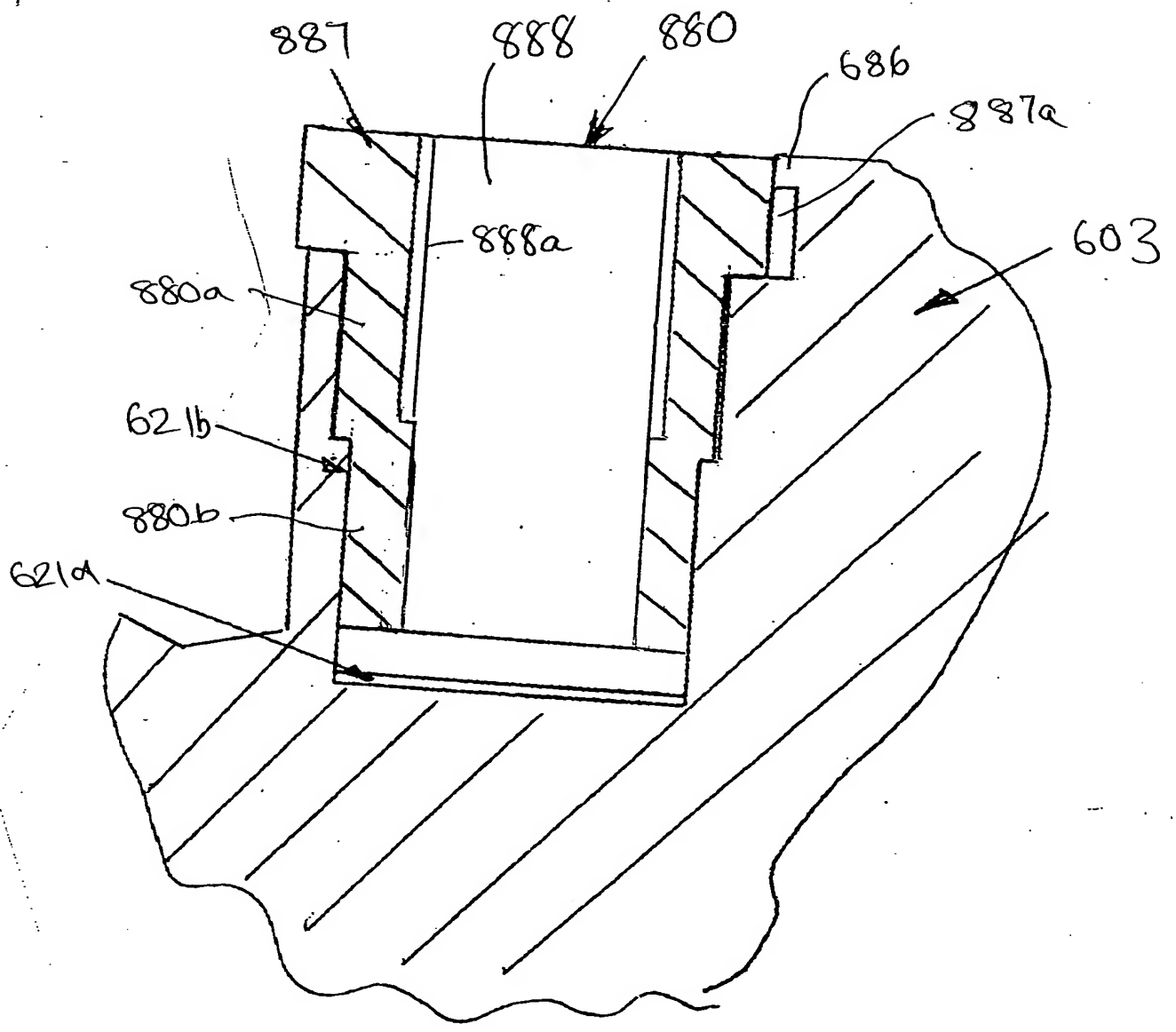


FIGURE 34

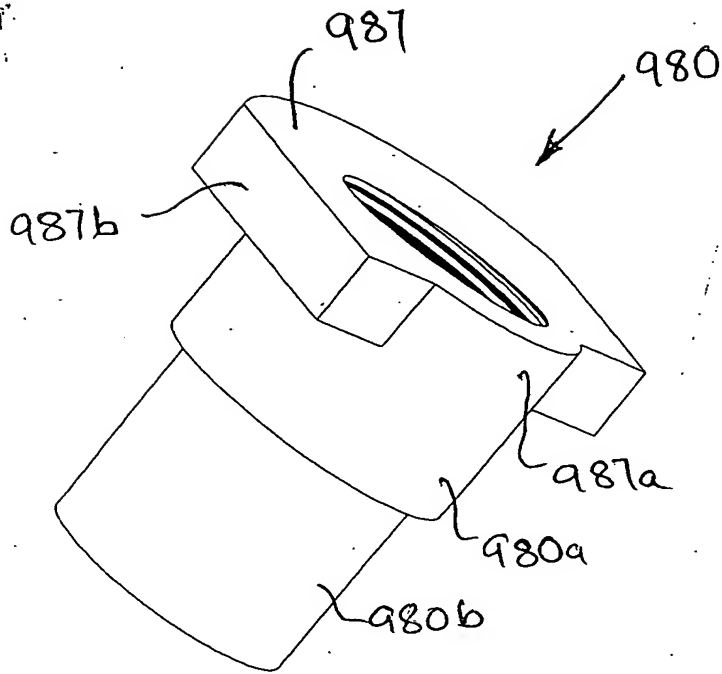


FIGURE 35

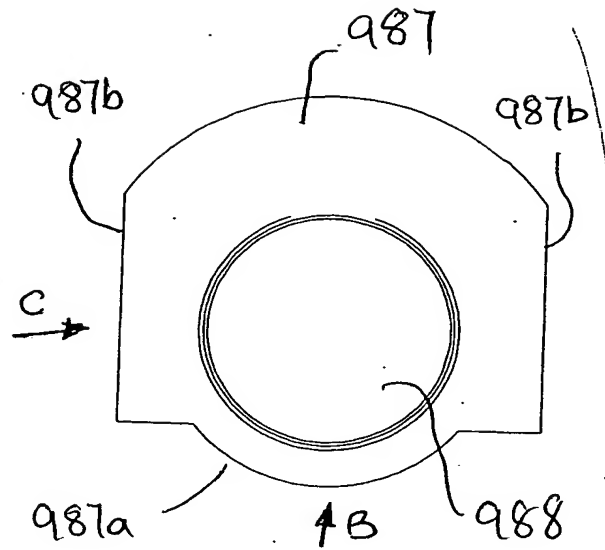


FIGURE 36

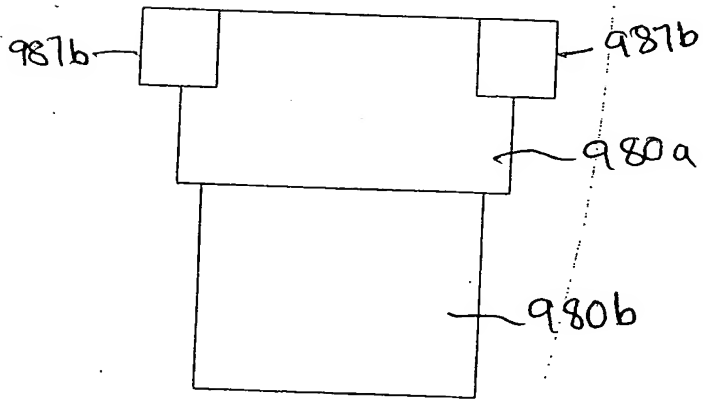


FIGURE 37

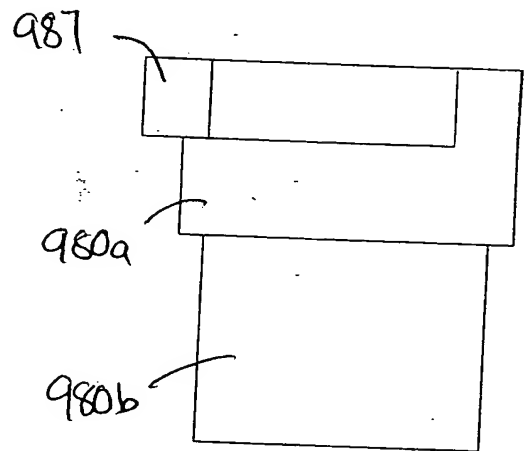


FIGURE 38

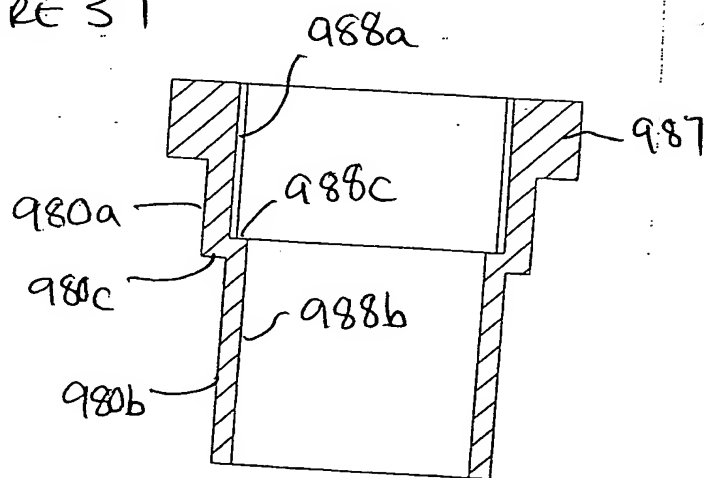


FIGURE 39

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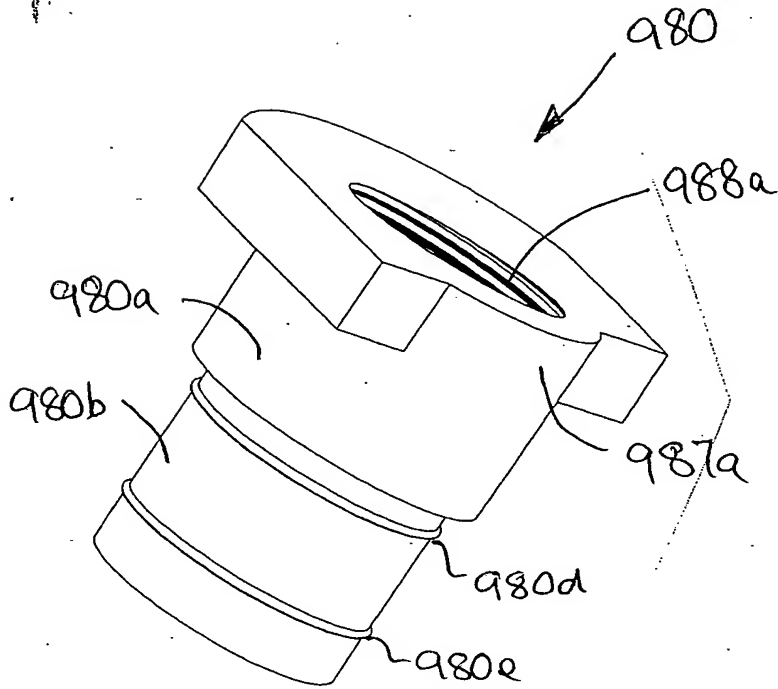


FIGURE 40

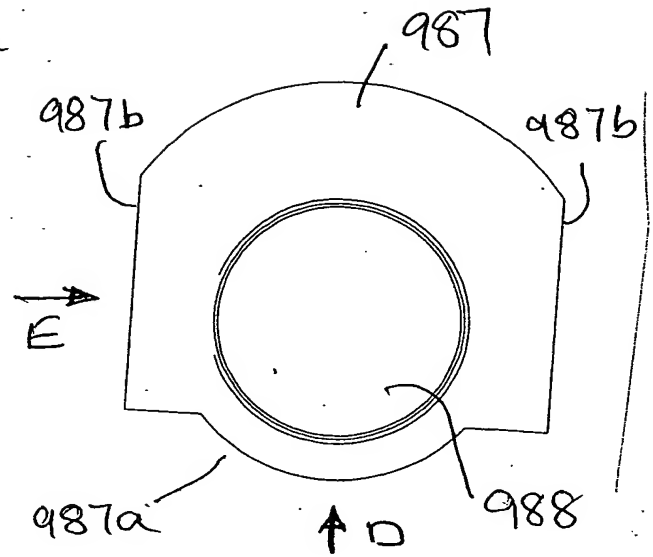


FIGURE 41

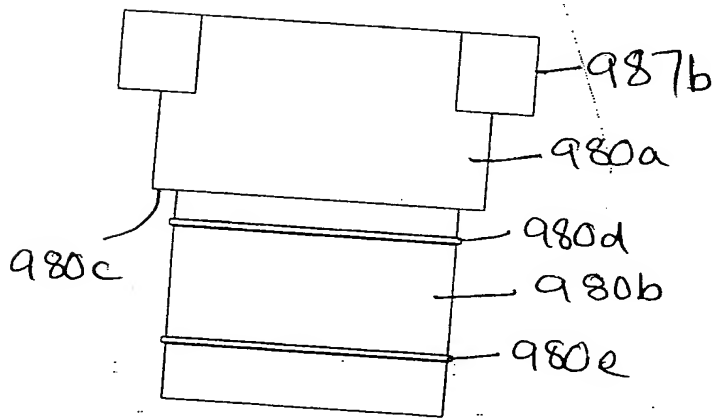


FIGURE 42

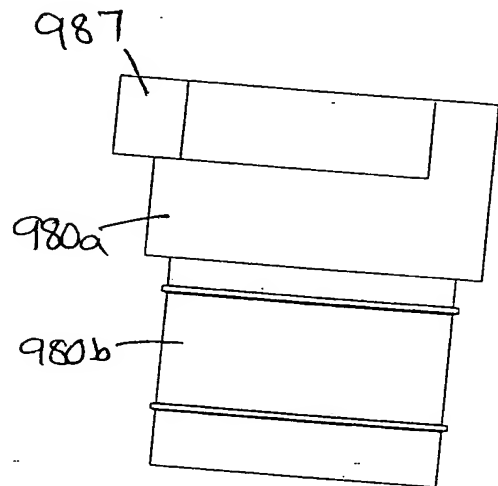


FIGURE 43

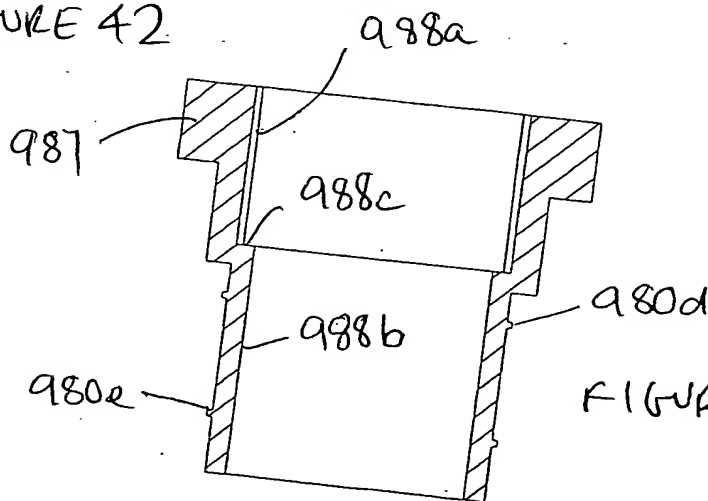


FIGURE 44

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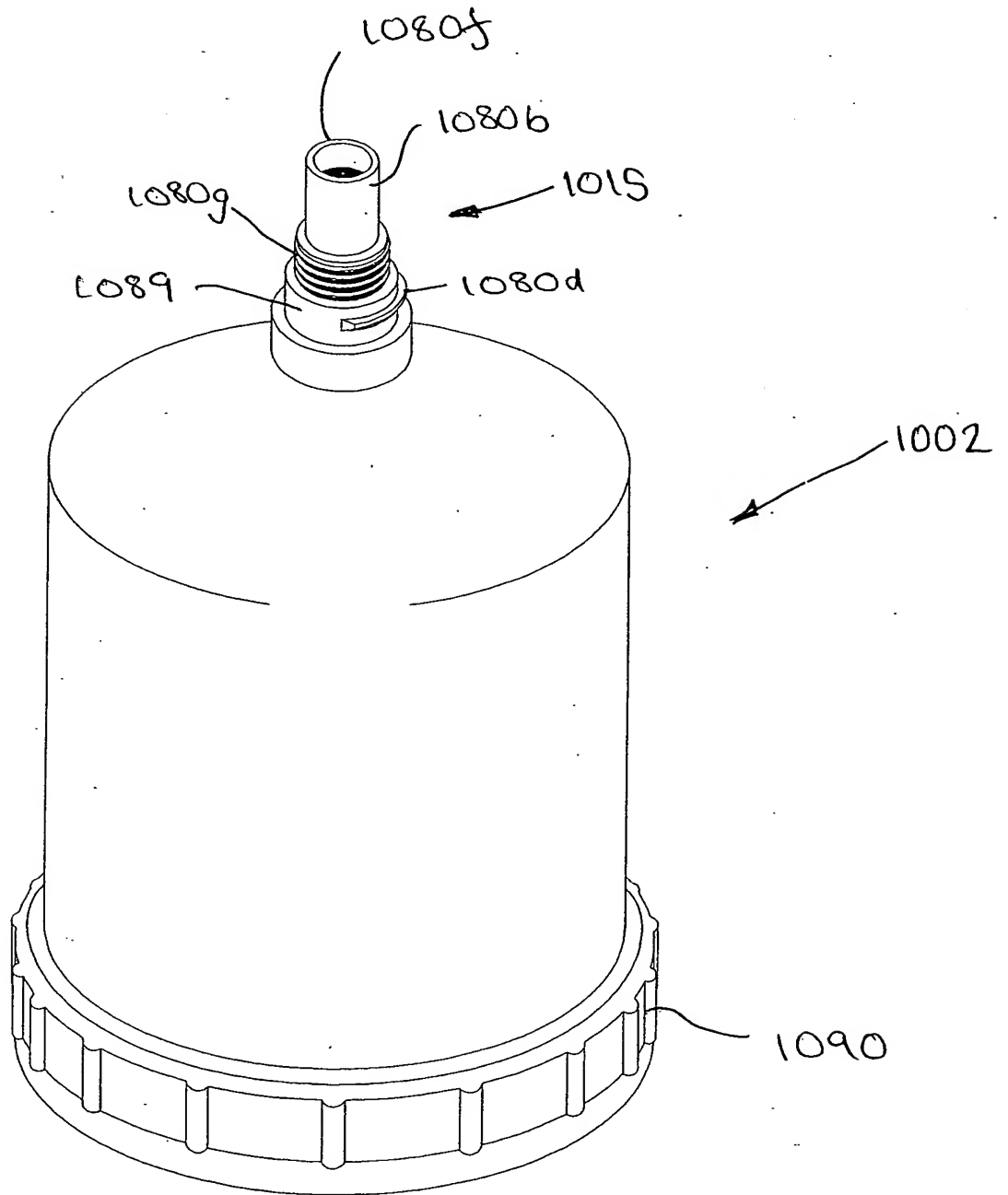


FIGURE 45

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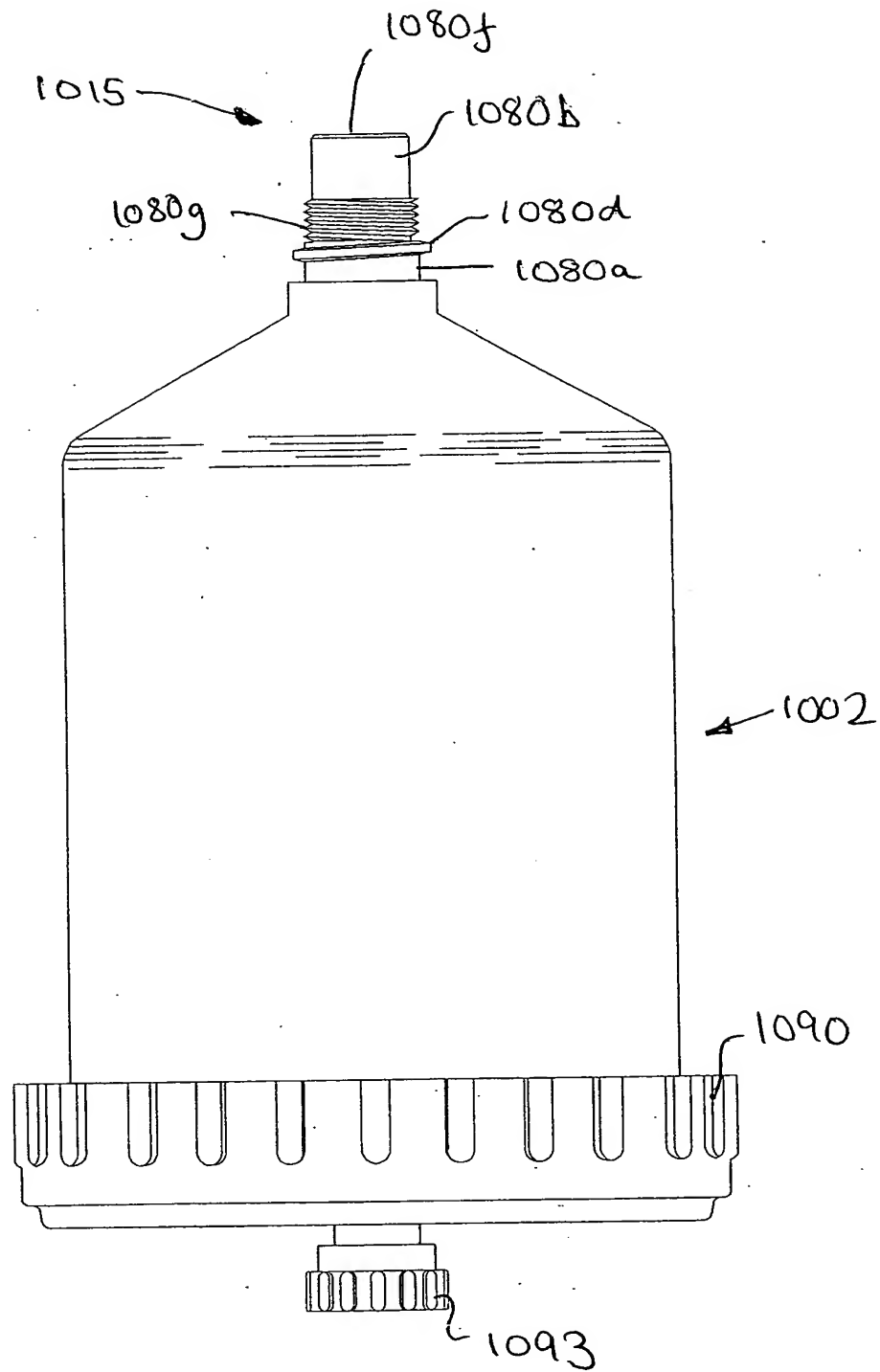


FIGURE 4b

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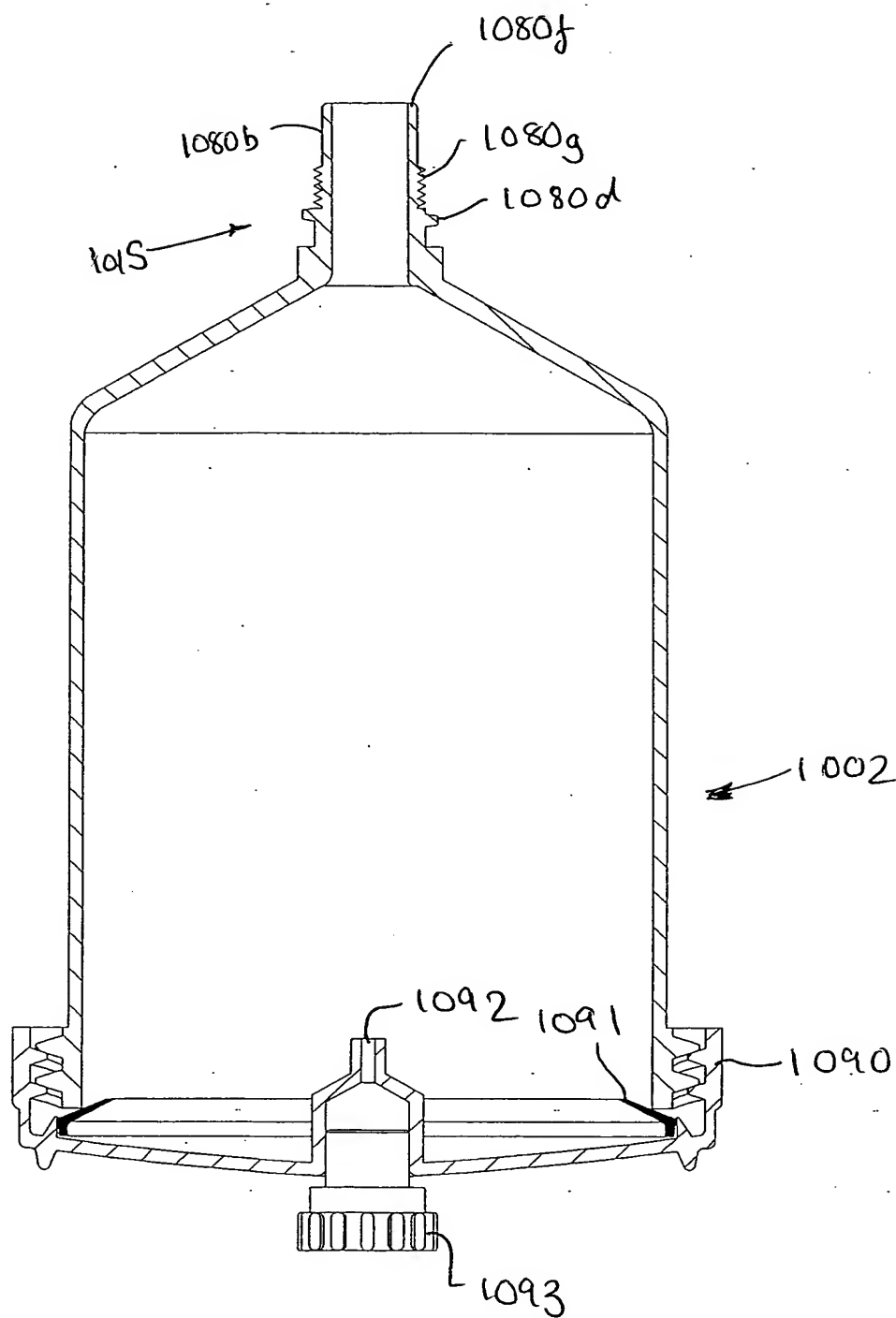


FIGURE 47

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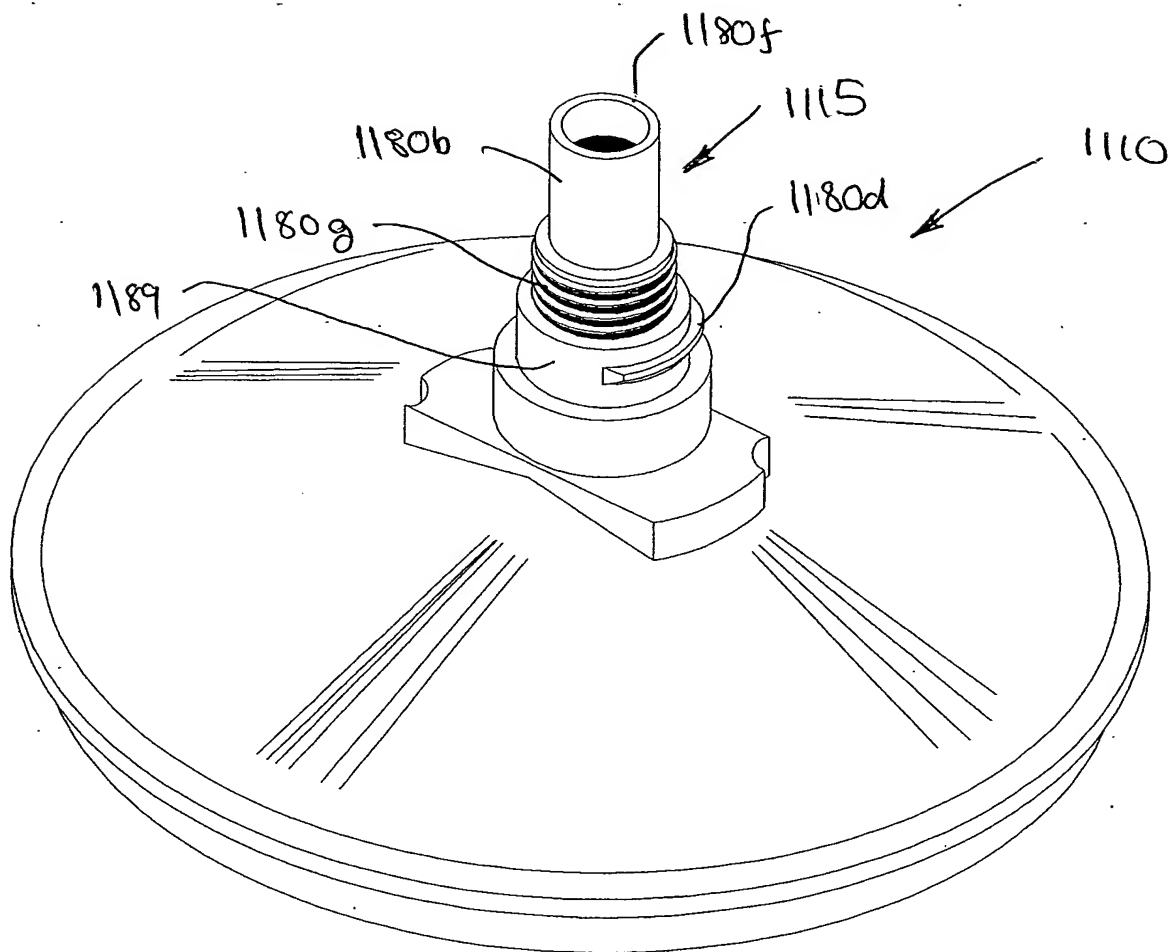


FIGURE 48

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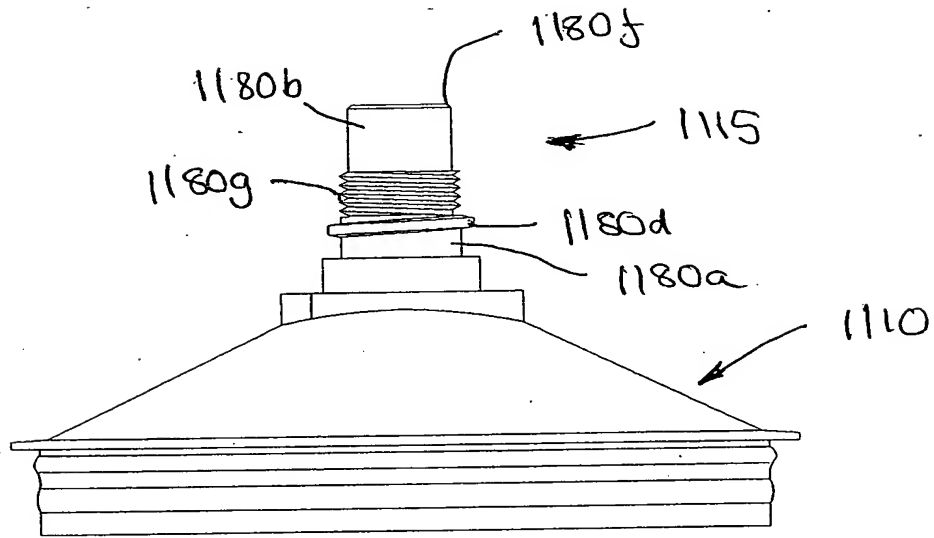


FIGURE 49

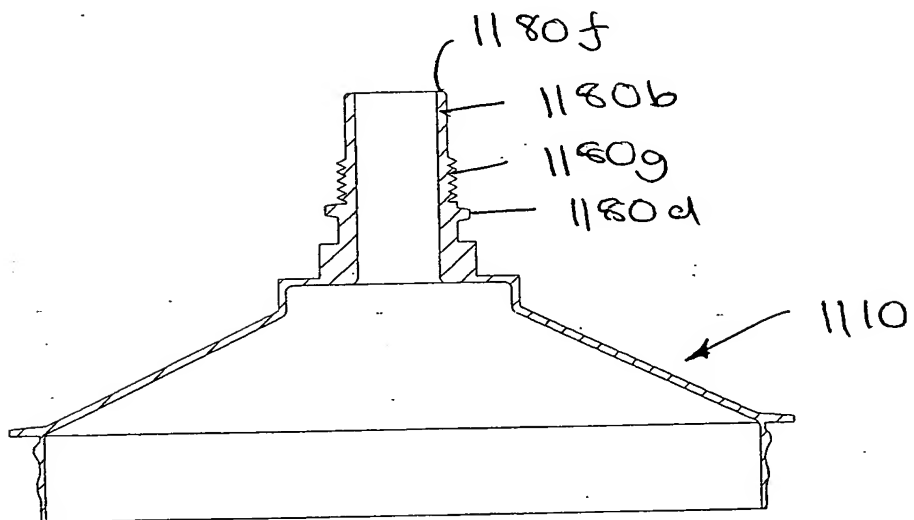


FIGURE 50

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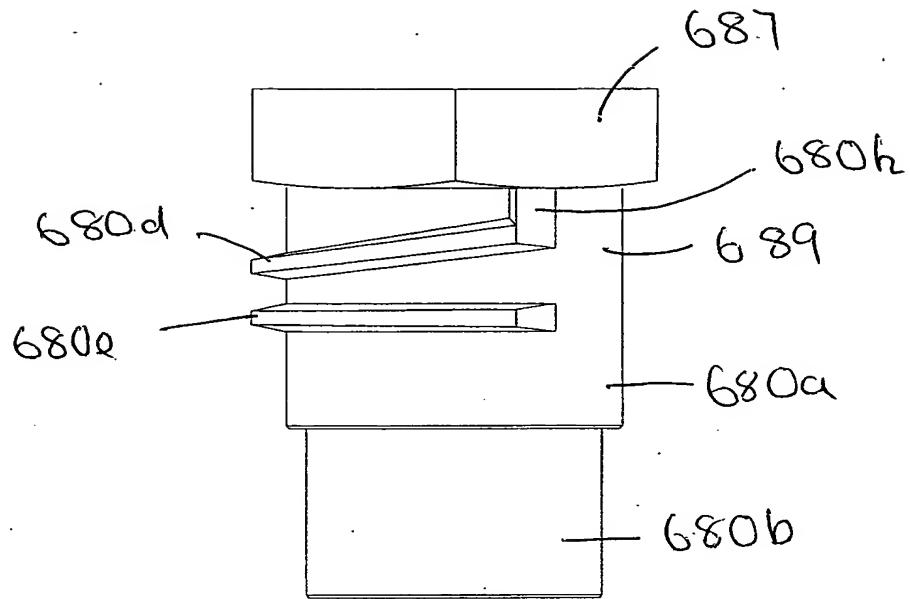


FIGURE 51

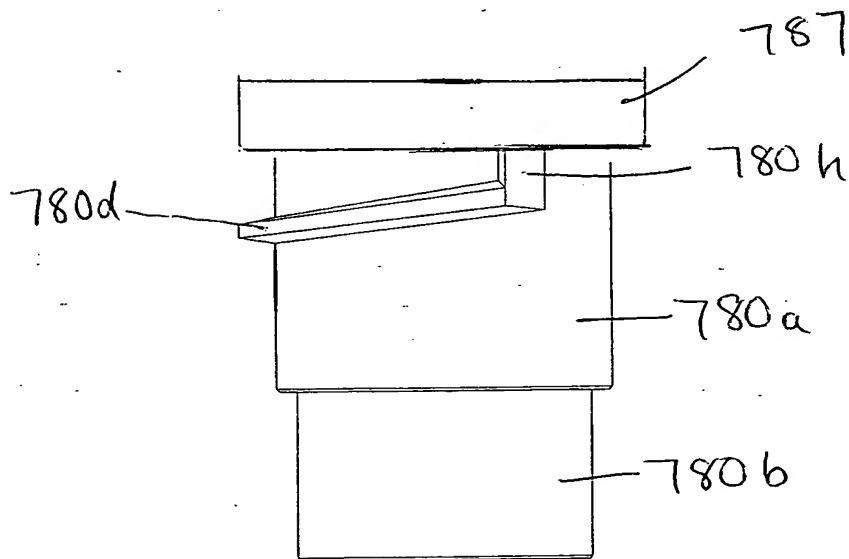


FIGURE 52

